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Economic Impacts

of

The Petition for Proposed Amendment of ARM 17.24.116 Pertaining to
Hard Rock Mining Application Requirements for Operating Permits

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Revised by
Montana Department of Environmental Quality
February 2006

Mining Rule Economic Impact Statement

Introduction to the Revised Version

The original version of this study was submitted to the Environmental Quality Council and posted to DEQ's website on Friday, January 6, 2006. It was thus available to the board and the public for a few days prior to the public hearings on the proposed rule change at Boulder on January 10, and Fort Belknap on January 11. Subsequent to the second hearing, the Board of Environmental Review (Board) amended the language of the proposed rule change to lower the standard of proof that water treatment would not be required beyond two years from "conclusively demonstrate" to "demonstrate by clear and convincing evidence." From a legal standpoint, this changes the standard from essentially a 100% guarantee to a 70% probability. The Board also inserted language specifying that operations existing at the time of adoption of the proposed change would be grandfathered, as would future expansions of those operations.

The Board directed the DEQ to reexamine the economic impact study by mid-February in view of the potential changes in wording. The comment period on the revised proposed rule change was extended to March 17.

Many oral and written comments were submitted at both hearings, but the transcript of the Fort Belknap hearing was not available as of February 9. At Boulder, the original version of the economic impact study was characterized by different individuals as both overstated and understated. Since the comment period is still open, it is not appropriate to respond to specific comments in this revised study, but the revision does offer an opportunity to clarify some assumptions which may have been confusing to readers, reexamine the numbers in light of the language changes, and perform additional editing.

These revisions have resulted in no major changes in our economic projections. The change in the proposed rule language has removed some of the technical difficulty regarding the standard of proof that long-term treatment would not be required. Comments from and conversations with several opponents, though, indicate that the perceived two-year limit is still a major area of concern, if not an outright "project killer."

We believe that the assumptions cited below are sound and realistic enough that the study does not overstate future economic impacts. It may be that the total dollar figures for future economic impacts are indeed understated. There are more metal mines operating in Montana in 2006 than in some of the base years examined for this study. The percentages of future mining prohibited or deterred, which range up to a high of 90%, can hardly be called understated. This study is a place for broad assumptions and conclusions, not detailed arguments over how many and which specific mineral resources already known to industry, DEQ, and the Montana Bureau of Mines and Geology may or may not be developed in the next twenty years and beyond. There are too many variables such as cyclical commodity prices and national economies, national priorities, national and state politics, industry, public and environmental group attitudes, etc., to allow more precise predictions. Metal prices have been on the rise for months to years, but there is as

yet little sign of mining companies gearing up for an exploration or development boom in Montana.

Executive Summary

This document estimates the economic impact to Montana of the proposed amendment of ARM 17.24.116. If the proposed rule were enacted, adverse economic impacts would fall mainly on several industrial sectors within Montana. These sectors include metal mining (e.g. gold, silver, copper), industrial mineral mining (including talc and limestone), and parts of Montana's economy closely associated with these industries such as in-state suppliers of mining equipment. Benefits from the rule would include a lower risk (or prevention) of taxpayers having to pay water treatment costs into perpetuity if mine reclamation bonds calculated by the state prove insufficient. Benefits would also include improved water quality near affected mines, increased protection of the environment near future mining activity, and possibly new jobs from additional water treatment during the life of future mines.

As a result of adopting the proposed rule as amended in January, 2006, an estimated 50-90% of future metal mining economic output and 10-25% of future industrial mineral mining economic output in Montana would be prevented from developing. These percentage figures apply to a long-run time horizon of 20 years or more after rule adoption. In the first 20 years after rule adoption, the adverse effects on both mining sectors would be smaller and the percentage figures lower due to exempting or "grandfathering" mines operating under current law. Overall, these two mining sectors comprise less than 1.5% of Montana's total economy in terms of jobs, wages, economic output and tax revenue. Therefore, the state economy as a whole would not be significantly affected by the proposed rule. However, mining's prominent history in Montana culture, its concentration in select counties, and the fact that mining jobs are high-paying would ensure that localized significant effects would occur. Based on current mine locations and where future mines would likely be located, Lincoln, Sanders, Jefferson, Madison, Beaverhead and Silver Bow counties would be most affected by this proposed rule.

In the long run for Montana, the proposed rule would result in an estimated 740 to 2600 future jobs lost or not created, \$47 to \$138 million in wages lost each year, \$84 to \$543 million in economic output lost each year, and \$7.1 to \$16.5 million in tax revenue lost each year. The domestic supply of talc in the U.S. might be reduced, but not severely so.

Background

This document estimates the economic impact to Montana of the revised proposed amendment of ARM 17.24.116 (from here on, the 'proposed rule'). If the proposed rule were enacted, adverse economic impacts would fall mostly on two industrial sectors within Montana. These sectors are metal mining (for example, gold, silver, and copper) and industrial mineral mining (mining of non-metallic products such as talc and limestone). Adverse effects would also fall on parts of Montana's economy closely

associated with these industries including equipment suppliers and service-related businesses such as gas stations or restaurants that get a significant amount of their business from mine workers. These adverse impacts would mainly occur in five or six specific counties including Lincoln, Sanders, Jefferson, Madison, Silver Bow, and Beaverhead. These counties are all located in the western half of the state. Beneficial impacts of the rule would affect water quality and quantity, water users near affected mines, and potentially taxpayers as well.

In this analysis, two scenarios are developed: 1) What mining in Montana would be like in the future under current law, and 2) What it would be like in the future under the proposed rule. The difference between these two scenarios is the estimated negative economic impact of the proposed rule. The positive economic impact would be the savings to taxpayers from avoiding the need for perpetual water treatment, any resultant improvement in environmental quality, and the effects on those who would benefit from that improvement.

This analysis is driven by assumptions because it is impossible to know exactly what will happen in the future with mining in Montana. The assumptions are based upon available information, the experience of Montana Department of Environmental Quality (DEQ) staff and other experts, and best professional judgment. In Montana, statistics for the mining sector are compiled in a manner to include metal mining, industrial mineral mining, coal mining and mining-related support activities. Because metal mining and industrial mineral mining would be primarily affected by this rule, it is those two economic sectors that are focused upon. For the purposes of this impact statement, industrial mineral mining includes talc and various types of stone such as rip rap, limestone and associated cement plants, basalt, and shale. Bentonite and other minerals regulated under the Opencut Act such as sand, gravel, peat, and soil are not included. Coal is regulated under the Montana Strip and Underground Mine Reclamation Act and would not be affected by this rule.

Assumptions for the Economic Impact Statement

General Assumptions Concerning the Proposed Rule

- The proposed rule, if passed, would become effective in 2006.
- The proposed rule would affect those mines regulated by the Metal Mine Reclamation Act (MMRA), which includes all metal mines and certain industrial mineral mines such as talc mines and limestone quarries. The rule would not affect gravel pits, scoria, or bentonite operations.
- Most rock pickers, small quarries, small hard rock mines, garnet and other placer operations would not be affected by this rule.¹ Most of these operations are covered under Small Miner Exclusion Statements.
- Under the proposed rule, mines applying for a new permit under the MMRA would not be allowed, starting two years after the completion of their operations, to treat surface or ground water for carcinogens or toxins in order to meet water

¹ Stated with the understanding that some rock pickers, placer operations, and garnet mines disturb more than five acres and therefore require operating permits

quality standards at any point of water discharge. In other words, starting two years after a mine closed, mine-related water discharge would have to meet water quality standards at the point of discharge without the need for treatment.

Existing statutory language (82-4-3-336 (3), MCA), states that "In the absence of an order by the department providing a longer period, the plan must provide that reclamation activities must be completed not more than 2 years after completion or abandonment of the operation on that portion of the complex." The "longer period" is not defined, and the discretionary latitude of the department is not spelled out.

- Toxic and carcinogenic pollutants as defined by Circular WQB-7, Montana Numeric Water Quality Standards (WQB-7), including nitrates, would be subject to the proposed rule (see Appendix A for a list of these pollutants).
- The currently permitted actions of the six large metal mines in Montana would be grandfathered and not affected by the proposed rule. These mines include Montana Resources (copper, molybdenum), Montana Tunnels (zinc, lead, silver, gold), Golden Sunlight (gold), Troy (silver, copper), Stillwater Nye (Platinum Group Metals, copper and nickel), and Stillwater East Boulder (Platinum Group Metals, copper and nickel). These mines make up a large portion of current total mining activity in Montana, and represent over 90% of metal mining activity in the state in terms of total economic output.² As modified in January, 2006, the proposed rule would not apply to future amendments or revisions of valid operating permits existing on the effective date of the rule change. Therefore, any future amendments, expansions or revisions of current operating permits at these six mines plus any other operating metal and industrial mineral mines at the date of the rule change (such as Montana's three operating talc mines) would not be subject to the proposed rule.
- The rule would apply to the proposed Rock Creek and Montanore mines in the Cabinet Mountains. These two projects are in the permitting process now, and might open in the next five years under current law.
- Any mines that use explosives could be affected by this rule due to the potential for nitrate exceedances in surface water from explosives residue. This includes mines which produce talc, chlorite, limestone, basalt, shale, and other apparently non-reactive rocks or minerals. Nitrate is currently listed as a toxic pollutant in WQB-7 (see Appendix A).
- Starting two years after a mine closes, this rule would eliminate mixing zones for mine-related discharged water based on the language in the rule that would require the water discharge to meet standards at the point of discharge.
- Because wastewater treatment would be forbidden starting two years after closure, wastewater treatment plants at mines would also be forbidden starting two years after closure.
- Currently operating mines that have no water discharge or no water quality exceedances would not be affected by the proposed rule. These make up a relatively small portion of Montana's total metal and industrial mineral mining

² One of the primary economic indicators that is used in this document is economic output. Economic output is the value of goods and services produced in an economy, which is typically calculated as the quantity of goods and services sold multiplied by the prices of those goods and services.

activity, and include stone quarries and mines, rip-rap operations, rock pickers, and placer mines which would be exempt from the rule anyway.

Assumptions about Future Mining in Montana Under Current Law and Under the Proposed Rule

- Adverse effects on state revenues and economic activity from the proposed rule would include lower levels of in-state metal and talc production, economic output, employment, personal income, and secondary economic business from mining. It would lead to less state and local revenue from the metal mines tax, the gross and net proceeds taxes, mine property taxes, the state tax on corporations, and individual income taxes. It could also affect on a small scale the revenues paid to and jobs available at the Montana DEQ, as well as recipients of Resource Indemnity Trust fund allocations.
- Beneficial effects from the rule could include the maintenance of Montana's current water quality in locations near future mines (and associated ecological benefits), fewer water quality issues down gradient from future mines, less chance of inadequate reclamation bonds leading to taxpayers' expense, and less environmental damage overall from future mining activity.
- Existing allowed mining technology would continue to be used by the mining industry. In other words, for the purposes of this study, it is assumed that there will be no "breakthrough" technology which would allow the exploitation of low-grade gold ores from surface pits without cyanidation.
- Current metal prices, which are high compared to recent norms, would remain high enough to maintain interest by mining companies.
- The economic contribution of future mining in Montana will be similar to past and current trends with the understanding that the industry is very cyclical and can significantly vary from year to year.
- Montana has thousands of known occurrences of potentially economic minerals. It also has the potential for major new mineral discoveries, as shown by the McDonald and New World projects in recent years. However, major discoveries generally occur in periods of widespread, broad-based mineral exploration, as seen in Montana in the 1980's and early 1990's. Given the apparent negative attitude of many major mining companies toward western states in general (except Nevada), and or Montana specifically, this kind of exploration boom does not seem likely in the foreseeable future. For this reason, we assume that mineral developments projected in this study will come from known mineral occurrences.
- Some known but undeveloped mineral deposits in Montana will not be developed in the near future under any circumstances due to various economic, legal and or political factors. Therefore, these mines (e.g. open pit gold mines that would require cyanide use to be economic or mines proposed in controversial locations) will not be affected by the proposed rule.
- The Montana Resources and Montana Tunnels mines are representative of future open pit metal mine operations in Montana. The Troy and Black Pine mines are representative of future underground mine operations in Montana.
- Exploration and or development projects including Montanore and Rock Creek (underground copper and silver), Lowland Creek (open pit copper and

molybdenum), Broadway-Victoria (underground or open pit copper-gold) and Cannivan Gulch or Bald Butte (open pit and or underground molybdenum) will be typical of potential future mining projects in Montana as opposed to projects like Zortman, Basin and Kendall, which would all be illegal today because of the cyanide ban.

- The currently permitted remaining life for each of the six large, grandfathered, metal mines in Montana is the following: Montana Resources--15 years, Montana Tunnels--2 years, Golden Sunlight--3 years, Troy--3 to 4 years, Stillwater Nye--20 years, and Stillwater East Boulder--20 years. These numbers are taken from current permitting documents and do not necessarily represent the actual potential mine life or total amount of ore or mineralized material known or remaining at these sites.
- Any of these six mines could apply for expansions to their operating permits, which could extend their operating life if approved.
- Based on the remaining life of their permits, three of the six grandfathered metal mines will end current operations in the next 10 years. These include the Troy, Golden Sunlight, and Montana Tunnels mines.
- In 20 years, by 2026, the remaining three grandfathered metal mines will be closed or near the end of their lives.
- Under current law, one of the three mines that would end operations in the next 10 years would be expected to apply for a new permit to expand operations beyond 2016. This expansion would not be subject to the proposed rule. The other two mines will close down within 10 years (by 2016).
- This one expanded mine, under current law, will end operations and close during the 2016-2026 period.
- By 2016, one of the two proposed mines in Montana's Cabinet Mountains will have begun operations under current law. Both projects are currently active. Given the range of possibilities that both, one, or neither might actually go into production in the time covered by this study, we have chosen the middle ground.
- The proposed rule would prevent or discourage this mine from opening, or it would delay this mine indefinitely.
- Under current law, other new mining projects in Montana will develop slowly and incrementally, as it will take some time for these potential deposits to be permitted and developed.
- One additional large metal mine, in addition to either Rock Creek or Montanore, will open in the next 10 years, for a total of two large new metal mines opening in the next 10 years in Montana under current law. This mine would be developed from a deposit already known or being explored.
- This additional large mine would not open under the proposed rule.
- The two new metal mines opened under current law in the 2006-2016 time period will be up to full operation in the 2016-2026 period, and a third new major metal mine will open under current law in the 2016-2026 period. This third mine would not be able to open under the proposed rule.
- For the sake of simplification, these three new mines expected to open in the next 20 years would each be the size of the average metal mine currently operating in Montana.

- In order to examine a range of possibilities, a scenario is also assumed where no new major metal mines will open in Montana in the next 10 years under current law.
- The metal mining industry in Montana is currently about 6 times larger than the industrial mineral mining industry (as defined above) in terms of economic output and this ratio will continue in the future.³
- Those who desire to exploit undeveloped mineral deposits in Montana that could feasibly be developed in the future, would closely study the rule if it were adopted, the geology and setting of their ore bodies, and the economics of their situations before making a decision whether to apply for a mining permit.

Baseline Economic Analysis: What Mining Would Look Like in the Future Under Current Law⁴

This section first examines what mining looks like today and what it looked like in the recent past. A range of numbers is then estimated for what mining will look like in the future under current law.

Metal Mining

Currently, metal mining in Montana is concentrated at six mines in five counties: Jefferson, Lincoln, Silver Bow, Stillwater and Sweet Grass. These counties are located in the northwest, west-central and south central portions of the state and the mines are situated near the towns of Jefferson City, Whitehall, Troy, Butte, Big Timber and Nye. Jefferson County contains two of the six large mines. The major metals produced at these mines include copper, gold, lead, molybdenum, palladium, platinum, silver and zinc. Two potential large metal mines that may open in the next five years would be located in Lincoln and Sanders counties in the Cabinet Mountains near the towns of Libby and Trout Creek. Montana is the only state in the U.S. with palladium and platinum production, ranks 4th nationally in gold production, 4th in zinc and lead, and 7th in silver.⁵

Today, there are over 2,000 employees in the metal mining industry in Montana and these workers earn over \$100 million annually.⁶ These workers also earn job-related benefits, and produce over \$300 million annually in economic output. Metal mining's impact on Montana's economy reaches beyond these numbers. To keep the mines operational, electricity, machinery, equipment, and other supplies are required, and these suppliers benefit from the mines. In addition, the mining and suppliers' employees spend their

³ IMPLAN model, Minnesota IMPLAN group.

⁴ Susan Ockert, Montana Department of Commerce, Census and Economic Information Center (November and December of 2005) is responsible for much of the writing and compiled data in this baseline section. This data is taken from Montana Bureau of Mines and U.S. Geological Survey (2003). <http://minerals.usgs.gov/minerals/pubs/state/mt.html>

⁶ Information for this paragraph was compiled by Susan Ockert and is taken from Employment, Compensation, and Output numbers derived from IMPLAN, an economic modeling software program. IMPLAN is produced by the Minnesota IMPLAN group (www.implan.com)

wages on groceries, gasoline, clothing, furniture, homes, and other purchases required to maintain their lifestyle. These wages thus produce an 'induced' economic effect.

In 2002, the most recent year of reliable data, Montana's metal mining industry directly employed 2,128 workers and supported an estimated additional 1,815 jobs from induced effects.⁷ Its wages paid out that year were \$113 million and it supported an estimated additional \$44 million in wages. Total economic output that year was \$327 million with an estimated additional \$153 million in economic output supported by the industry. Rounding these numbers, the estimated average annual total induced effects from metal mining today in Montana are about 1,800 jobs, \$45 million in wages, and \$150 million in output.⁸ Precious metal mining, which includes gold, silver, palladium and platinum, is by far the largest subsector in the metal mining industry. At the other end of the scale is iron ore mining with only 5 employees (at a mine which has been closed and reclaimed since 2002).

Today, employee compensation for miners averages \$53,000, while compensation for all employees tied to the metal mining industry averages about \$40,000 (Department of Labor and Industry, Research and Analysis Bureau web site). In 2003, the average wage per job in Montana was \$26,869 (U.S. Bureau of Economic Analysis, Regional Economic Accounts, Table CA-34)). In 2005 dollars, this would be around \$28,800. Clearly, metal mines jobs are very high paying in Montana compared to the average wage paid in the state for all jobs (84% higher).⁹ With the current high commodity prices for metals, output per worker today averages over \$150,000. Output per worker for all industries supported by metal mining averages \$121,000 (Susan Ockert, Montana Dept. of Commerce).

Approximately \$13.5 million is collected annually in state-level taxes on Montana metal mining. Property tax revenue currently collected at the state level in Montana from metal mines is approximately \$4.0 million annually under current law (with fluctuations in that amount occurring from year to year). Most of the property tax assessed to metal mine operations is on business equipment (Montana Department of Revenue, Tax Policy and Research, December 2005).¹⁰ The gross proceeds tax collected on all metal mines was

⁷ Ibid

⁸ Those industries with the highest output tied to the metal mining industry include manufacturing, health care, and utilities. From an employment standpoint, the metal mining industry in Montana supports an estimated 272 workers in health care, and 249 workers in retail, including those that work at grocery stores, motor vehicle and parts dealers, department stores, and online auction sites. This is part of the 1,815 additional jobs created. Other employment supported by this industry includes bankers (finance and insurance), lawyers and accountants (professional, scientific & technical services), waiters and waitresses (accommodations and food services), teachers (educational services), and artists (arts, entertainment and recreation). Mining operations require large amounts of electricity and fuel. An estimated \$14 million of power generation plus over \$8.8 million of petroleum refinery products are consumed by the metal mining industry (IMPLAN model).

⁹ In this paper, when a number is converted into 2005 dollars, the 'U.S. Department of labor, U.S. Labor Statistics, Consumer Price Index for all Urban Consumers' is used to make that conversion

¹⁰ During FY 2005, the five largest metal mines in Montana had a total taxable value of \$8.99 million on their property (Montana Department of Revenue, Tax Policy and Research, December 2005), and data for the sixth was not available. Rounding up to \$10 million in total taxable value for all metal mines (in order

\$4.43 million in 2004 and \$3.67 million in 2003.¹¹ The tax collected was \$4.02 million for tax year 2002 and \$4.06 million in tax year 2001.¹² Thus, a reasonable average amount collected for the gross proceeds tax today is estimated to be \$4.0 million a year. The metalliferous mining tax collected in FY 2004 for Montana was \$5.57 million and averaged \$5.52 million annually from FY 1998 to FY 2004 (Montana Department of Revenue, Biennial Report, 2002-2004). The average used for today's annual collection of that tax is \$5.5 million.

These three major metal mine taxes (property, gross proceeds, metalliferous mining) add up to about \$13.5 million per year in average tax revenue from metal mines. It is assumed that future amounts will average about the same (using 2005 dollars). Estimating the state corporation tax collected from mines is beyond the scope of this paper, but the amount collected annually is small compared to the \$13.5 million figure. Of this \$13.5 million collected annually, approximately \$5.0 million is distributed to the state general fund, \$3.7 million to counties and local government, \$1.0 million to special accounts under the metalliferous tax, \$3.6 million to schools, and \$0.2 million to other miscellaneous accounts.¹³

TABLE 1-Metal Mining and its Current Economic Contribution in Montana

	Direct Effects	Induced Effects
Jobs	2,128	1,800
Total Annual Wages	\$113 million	\$45 million
Annual Economic Output	\$327 million	\$150 million
Annual Tax Revenue	\$13.5 million	--
Metal Output	Only Platinum Metals Group mine in U.S., 4 th in U.S. in gold, zinc and lead production, 7 th in U.S. in silver	
Counties most supported by current metal mining	Jefferson, Stillwater, Sweetgrass, Silver Bow	
Average Wage	\$53,000	

Industrial Mineral Mines

to include the contribution of the sixth big metal mine and all other small metal mines), and multiplying that number by the average mills as collected under the gross proceeds tax, 425 mills, it is estimated that \$4.25 million in property taxes were collected for metal mining in 2004. \$4.0 million is used as a conservative annual average.

¹¹ Montana Department of Revenue Biennial Report, 2002-2004, pp. 115 and 119.

¹² Montana Department of Revenue Biennial Report, 2000-2002, pp. 110 and 115.

¹³ Currently, 58% of metalliferous mines tax revenue is deposited in the state general fund, 8.5% in the hard rock mining reclamation account, 7% in the reclamation and development grants account, 2.5% in the hard rock mining impact trust account, and 24% to the county or counties identified as experiencing fiscal and economic impacts under an impact plan. If no such plan has been prepared, that same 24% goes instead to the county in which the mine is located. MCA 15-37-117. Part of the 8.5% that goes into the hard-rock mining reclamation account is distributed to the Montana DEQ (under certain circumstances), which will be discussed later. The metal mines gross proceeds tax is Class 2 of the property tax and is allocated to taxing jurisdictions based on their mill levies. General property taxes collected from mines are allocated to taxing jurisdictions based on their mill levies.

The economic sub-sector of industrial mineral mining that falls under the Metal Mine Reclamation Act includes talc and various types of stone such as rip rap, limestone and associated cement plants, basalt, and shale. To reiterate, industrial mineral mining in this impact statement does not include minerals regulated under other acts, such as sand, bentonite, gravel, coal, peat, and soil. Currently, industrial mineral mining in Montana is located in many counties in the southern and western portions of the state. The largest operations are located in Madison, Beaverhead, Broadwater, and Gallatin counties. These include three talc mines and three talc processing plants located in Madison and Beaverhead counties. Major limestone operations are located in Jefferson, Broadwater, Gallatin, and Carbon counties, with major cement plants near Montana City and Three Forks.¹⁴

With just under 400 employees in the industrial mineral mining sector, these workers earn almost \$8 million in wages, and produce over \$45 million in economic output¹⁵. Like metal mining, industrial mineral mining's impact on Montana's economy reaches beyond these numbers. Montana's industrial mineral mining sector directly employs 394 workers (U.S. Department of Labor, Bureau of Labor Statistics, Quarterly Census of Employment and Wages) and supports an additional 172.¹⁶ It directly compensates employees \$7.7 million per year with an additional \$4.1 million supported by the industry. It directly contributes \$45 million in economic output per year and supports another \$17 million. Rounding these numbers, the estimated average annual induced effects from industrial mineral mining today in Montana are about 175 jobs, \$4 million in wages, and \$17 million in output. Employee compensation for industrial mineral mine workers averages around \$31,000, while compensation for all employees tied to the industrial mineral mining industry averages about \$28,000.

The net proceeds tax covers industrial mineral mines. The net proceeds tax collected in Montana from industrial mineral mines was \$3.02 million in tax year 2004, and \$2.88 million in 2003.¹⁷ It was \$2.93 million in 2002 and \$2.62 million in tax year 2001.¹⁸ A reasonable number to use for the average annual amount of taxes collected today on mineral mines is \$3.0 million. The net proceeds of miscellaneous mines is subject to mill levies of those taxing jurisdictions in which the mine is located and is distributed as such. The tax is distributed on the basis of relative mills levied by all jurisdictions levying taxes in the area. Because some of the non-metal mines are small, it is impossible to estimate the property taxes they pay. Currently from industrial mineral mines, using the \$3.0

¹⁴ Some of this data is taken from Montana Bureau of Mines and U.S. Geological Survey (2003), <http://minerals.usgs.gov/minerals/pubs/state/mt.html>

¹⁵ Information for this paragraph (except where indicated) was compiled by Susan Ockert and is taken from Employment, Compensation, and Output numbers derived from IMPLAN, an economic modeling software program. IMPLAN is produced by the Minnesota IMPLAN group (www.implan.com).

¹⁶ From an employment standpoint, the industrial mineral mining industry supports workers in health care, retail, and transportation (including 27 truck drivers) as well as bankers, lawyers and accountants, waiters and waitresses, teachers, and artists. Those industries with the highest output tied to the industrial mineral mining industry include transportation, manufacturing, and utilities. Mining operations require large amounts of electricity and fuel, and several million dollars of power consumption and petroleum refinery products are attributed to the industrial mineral mining industry (IMPLAN).

¹⁷ Montana Department of Revenue Biennial Report, 2002-2004, pp. 115 and 119

¹⁸ Montana Department of Revenue Biennial Report, 2000-2002, p. 110

million average annual tax collection, approximately \$0.65 million is distributed annually to the state general fund, \$0.9 million to counties and local government, \$1.36 million to schools, and \$0.08 million to other miscellaneous accounts.

TABLE 2-Industrial Mineral Mining and its Current Economic Contribution in Montana (2002 data)

	Direct Effects	Indirect Effects
Jobs	394	175
Total Annual Wages	\$7.7 million	\$4 million
Annual Economic Output	\$45 million	\$17 million
Annual Tax Revenue	\$3.0 million	--
Mineral Output	1st in the U.S. in Tale	
Counties most supported by current industrial mining	Madison, Beaverhead, Jefferson, Broadwater, Carbon	
Average Wage	\$31,000	

Metal and industrial mineral mining make up a small percentage of Montana's economy—less than 1.5% for all economic indicators. Metal mining and industrial mining put together average about 1.3% of total economic output in Montana today.¹⁹ The two industries together average about 0.5% of total jobs in Montana today (U.S. Bureau of Economic Analysis, Regional Economic Accounts, U.S. Census--2002 Economic Census). From 1997 to 2004, the two industries together have averaged 1.0% of Montana's total wage and salary disbursement, recognizing that the average wages in metal mining are far greater than the state average. Overall tax revenue from both types of mining including estimated property taxes on equipment is just under 1% of total annual tax revenue collected in Montana, although it comprises a larger percentage of local tax revenue collections in counties most affected by mining. The \$12.5 million collected annually for the three mining related taxes (gross proceeds, net proceeds, metalliferous mines) is about 6% of total natural resources taxes collected in the state of Montana today. Natural resource taxes totaled just under \$150 million in 2004 and included large sums of money from coal, gas and oil (Montana Department of Revenue, Biennial Report 2002-2004, p. 33).

Ranges for Baseline Economic Data

The numbers derived so far provide averages for current economic activity in Montana as a result of metal and industrial mineral mining. It is assumed that these numbers are good averages to use for estimated future mining activity under current law. It is, however, important to use ranges around these average job, wage and output numbers in order to estimate future mining economic activity in Montana. The reason for this is that estimated numbers for future mining under current law will determine the estimated

¹⁹ U.S. Bureau of Economic Analysis, Regional Economic Accounts. Montana's total economic output is measured as Gross State Product. Gross State Product is a measure of the total value of goods and services produced in a particular state. Because Gross State Product is essentially the same thing as economic output, these two measures can be used together and are referred to interchangeably as economic output.

economic impact of the proposed rule derived later in this document. A range of numbers for both estimated future mining activity under current law and for the amount of mining that would be affected by this rule allows a number of possibilities, based on an unknown future, of how this rule could affect Montana. Examples of unknowns in this analysis include a future mining boom versus a future decline, and the extent to which future mines will be able to economically operate under the proposed rule.

It is impossible to predict future long-term booms or busts in Montana's mining industry because the mining industry is so cyclical and subject to worldwide economic forces. As an alternative, the past 25 years of available mining economic data from the U.S. Bureau of Economic Analysis are used to develop ranges for key economic numbers. Metal and industrial mineral mining employment, wage and output numbers from 1977 to 2002 are used to determine ranges for future mining estimates in Montana under current law.²⁰ In most cases, the second highest and second lowest years from 1977 to 2002 are used as the upper and lower range for estimating the future numbers of jobs, total annual wages and total annual output in these two sectors for Montana. For a few of these numbers, other techniques are used where appropriate. The average numbers derived above from today's mining operations fall somewhere within these ranges, and often towards the low end indicating that mining today has dropped off a bit from the average over the last 25 years. Estimating ranges for future tax revenue is beyond the scope of this paper, so current numbers are used. All numbers presented in these ranges are given in current dollars.

It is important to note that mining jobs, wages and economic output in the past few years (2001-2005) fall toward the lower end of the range they have experienced from 1977 to 2002. On the other hand, current metal prices are high and currently continue to rise for metals like gold, silver, lead, copper, platinum and zinc. Some of these prices are at record highs.²¹ If gold and other metal mining activity increases in Montana under current law as a result of these prices, then using a range of values allows for the possibility of a future mining boom in Montana, just as it allows some room for the possibility of a downturn in future Montana mining (especially considering the recent cyanide ban).

The following two tables present the estimated ranges of future metal and industrial mineral mining economic activity in Montana under current law. Again, the numbers are reported in 2005 dollars. Appendix B at the end of this paper gives more detail on how these ranges were developed.

²⁰ These historical data were compiled by Susan Ockert, Montana Department of Commerce, Census and Economic Information Center, November 2005. These data were obtained from the U.S. Bureau of Economic Analysis, Regional Economic Accounts. 2002 is the most recent year of reliable data

²¹ In a recent Reuters report (December 8, 2005), it is stated that gold prices are likely to remain strong in the near term, that prices are at their highest levels in more than 24 years, and that gold still has upside price potential

TABLE 3-Metal Mining and the Estimated Range of its Future Economic Contribution in Montana (in 2005 dollars)

	High Estimate	Low Estimate
Long-Term Jobs	2,785	1,378
Total Annual Wages	\$150 million	\$92 million
Annual Economic Output	\$582 million	\$160 million
Annual Tax Revenue	\$13.5 million	--

Data source: U.S. Bureau of Economic Analysis, Regional Economic Accounts

TABLE 4- Industrial Mineral Mining and the Estimated Range of its Future Economic Contribution in Montana

	High Estimate	Low Estimate
Long-Term Jobs	636	350
Annual Wages	\$12.4 million	\$7.7 million
Annual Economic Output	\$77 million	\$41 million
Annual Tax Revenue	\$3.0 million	--

Data source: U.S. Bureau of Economic Analysis, Regional Economic Accounts

Adverse Economic Effects (Costs) of the Proposed Rule

General

As a result of the rule, an estimated 50-90% of future metal mining economic output and 10-25% of future industrial mineral mining economic output in Montana would be prevented from developing. The derivation of these percentage ranges is discussed below. Overall, the mining that would be affected comprises less than 1.5% of Montana's economy in terms of jobs, wages, output and tax revenue. Therefore, the state economy as a whole would be not significantly affected. However, mining's prominent history in Montana culture, its concentration in select counties, and the fact that mining jobs are high-paying would ensure that localized significant effects occur. Based on where current mines are located and where future mines would likely be located, Lincoln, Sanders, Jefferson and Silver Bow counties would be most affected by this proposed rule, plus any other county where a major future mine would not be able to open. Unrealized potential for jobs, personal income, local tax revenue, and secondary business due to the proposed rule would be concentrated in these counties. Cumulative effects from the current downward trend of other extractive industries could exacerbate these adverse effects—especially in Lincoln County. The existing Stillwater mines would likely be able to expand even under the proposed rule, so that Stillwater and Sweetgrass counties would therefore not feel significant effects from the rule, unless the rule discourages a future third Stillwater mine farther along the strike of the JM Reef ore body.

Residents of counties and towns most affected by the rule change as well as mining workers and their families would experience adverse psychological and emotional costs to the extent that their livelihoods were forgone. On the other hand, almost all of those workers would find other work eventually, and the initial costs would likely diminish within a year or two. Alternative work might involve costs such as moving and or taking lower pay.

Mining company owners and executives (many of whom live outside of Montana) would forgo some of their future profits from mining. Stockholders in the publicly traded companies might experience lower returns on their investments as a result of the rule. These stockholders reside nationwide and are not necessarily concentrated in Montana. To the extent that owners, executives and stockholders live outside of the state, these adverse effects would not fall on Montana.

As a result of the proposed rule, fewer tons of Montana-mined metals would be available for U.S. and world consumption. As mentioned earlier, the major metals found in Montana include gold, silver, copper, zinc, palladium, platinum, molybdenum, and lead. The major industrial minerals found in Montana that could be affected by this rule include talc, limestone and other types of stone, basalt, and shale.²² The only metals and minerals currently mined in Montana that constitute a significant U.S. share of the market are talc, palladium and platinum. Palladium and platinum mines in Montana would likely not be affected under the proposed rule. Thus, the consumption and the uses of metals as a result of the proposed rule would not be significantly affected on a national or world scale. The amount of talc produced in Montana is significant on a national scale (36% of U.S. production in 1993). Therefore, any affect on Montana's talc mines could have a significant effect on talc supply at a national level, although perhaps not a severe one. The way that certain types of mining are done in Montana would have to change. As a result of the rule, some mine operators and managers would have to consider additional costs before opening a new mine or expanding operations at an existing mine. Feasibility studies done on these projects would have to take into account increased operational controls of nitrates, and would have to consider developing facilities with liners above and below waste rock dumps, tailings impoundments, and other deposits of mine wastes that could leach pollutants. Mill sites and loadout facilities might also need to be encapsulated to prevent the potential for the treatment of seepage from these facilities and thus eliminate flows at closure.

These additional requirements would add to costs and reduce profits of affected mining operations. The feasibility studies done by project developers would consider these additional costs and this would in some cases affect the decision to mine or not. On a lesser scale, the proposed rule might affect the decision of what ore grade is economically feasible, and thus affect how large a mine could be.

²² Copper is used in electric cables and wires, switches, plumbing, heating, construction, and pharmaceutical machinery. Gold is used in dentistry and medicine, jewelry and arts, medallions and coins, in ingots as a store of value, and for scientific and electronic instruments. Silver is used in photography, chemistry, jewelry, electronics, as currency, in lining vats and other equipment for chemical reaction vessels, in medicine, as a catalyst in manufacturing, and for dowries and other expressions of prosperity in some cultures. Zinc and lead are used in numerous manufacturing and construction applications. Platinum and palladium are used principally in catalysts for the control of automobile and industrial plant emissions, in jewelry, in bushings for making glass fibers used in fiber-reinforced plastic and other advanced materials, in electrical contacts, and in capacitors ('Facts About Minerals', Mineral Information Institute, <http://www.mii.org/commonminerals.html>). Talc is used for the manufacture of catalytic converters, controlling the whiteness of paper, and can be used as part of the anti-block agents that prevent plastic films from sticking together. Basalt and shale are used for railroads and road-bed material.

The mines most affected by this rule would include future silver, copper, (non-cyanide using) gold, and molybdenum mines as well as at least one talc mine. A primary reason that these types of metal mines would be most affected by the proposed rule is because the water runoff or drainage inherent in these types of operations (with the exception of talc) can produce metal leaching caused by acid rock drainage (ARD). Metal leaching leading to violations of water quality standards can also occur in a near-neutral pH environment. It may be impossible with metal leaching to have discharge water that meets all standards two years after mine closure. The reason is that most metal leaching leads to water discharge with one or more pollutants that exceed standards. Not all mines would have this problem. Observation, lab work, and analysis have led the DEQ to conclude that relatively low-sulfide deposits such as Troy, Rock Creek, and Montanore do not, or would not, produce ARD. Nevertheless, near-neutral mine discharge water from these deposits would carry trace amounts of copper in excess of standards indefinitely (in addition to nitrate for a period of years), and therefore these kinds of operations also might not be permitted under the proposed rule.

It is also important to note that the proposed rule could prevent permitting of mining operations that have neither of these problems but that use explosives, such as talc mines. Mines that use explosives could be affected by this rule due to the potential for nitrate exceedances in surface and ground water from explosives residue. The most commonly used explosive in mining is ANFO, a mixture of ammonium nitrate and fuel oil. Blasting leaves a residue of nitrate, which can bleed into mine waters, and may cause exceedances of water standards until it attenuates over a period of years. This could be a problem for mining-related rock piles near or over creeks or drainages. This nitrate issue could apply to most metal mines in Montana and to at least one talc mine. It could also apply to other operations where rock is mined for cement production, building material, riprap or aggregate that otherwise do not have water problems. For those future mines that would not be prevented by the proposed rule, this rule could mean some short-term and intensive water treatment would be required while a mine is operating that would not be required under current law.

Other problems have been observed with parts of the mining industry that have not been mentioned here and could be affected by the rule. There is the potential for the milling reagents used for some operations to exceed water quality standards as cyanide did. Other products used in the mining and milling process could also cause problems in the same way that nitrates would from blasting. The DEQ has also encountered problems to date with chromium from cement kiln bricks, arsenic from underground mine railroad ties treated with wood preservatives, and byproducts from diesel spills during operations. Finally, there is the potential for waste rock removed to access ore to contain at least one parameter that exceeds water quality standards, such as fluoride, thallium, or selenium.

It is also important to note that mining-related exploration activities in Montana could be immediately curtailed by this rule. If the perception of would-be investors as a result of the proposed rule is that future mining would not be feasible and/or desirable in Montana,

then exploration could drop off still further, leading to further adverse economic effects from the rule.

Effects on Metals Mining

Using best professional judgment, it is estimated that, in the long run, 50-90% of future metal mining economic output in Montana would be discouraged or made unlikely by this rule. In other words, it is estimated that the total economic activity from metal mining in Montana would eventually be reduced by 50 to 90 percent as a result of this rule as compared to what could occur under current law. Economic output includes not just future mines but also exploration and support activities for future mines. It would take some time for this 50-90% effect to fully take place, and thus the estimated effects in the first 20 years after the rule went into law (2006-2026) would be substantially less than the estimated long-run 50 to 90 percent range. On the low end of that range, about half of mining activity would continue in the long run (as compared to what would happen under current law) with likely increased water treatment costs, and about half of mining would not occur because mines would not be able to meet the requirements of the rule. On the high end of the range at 90%, the vast majority of hard rock mining that would occur in the future under current law would not occur under the proposed rule.

Effects of the rule through 2016

It is estimated that the proposed rule would decrease metals mining by 0-25% over the entire 10 year period from 2006 to 2016. In 10 years (2016), three of the six current large metal mines in Montana will probably have ended operation under their current permits. These include the Troy, Golden Sunlight, and Montana Tunnels mines. It is assumed for this analysis that in the next 10 years under current law, one of these three mines will apply for and be approved for a major amendment to expand and operate beyond 2016. The other two mines will close down by 2016 regardless of the rule. It is assumed for this analysis that by 2016, one of the two proposed mines in the Cabinet Mountains will begin operations under current law, and that the proposed rule would prevent or discourage this one mine from opening, or delay it indefinitely.

Under current law, other new mining projects in Montana are expected to develop slowly and incrementally, as it will take some time for these potential deposits to be permitted and developed. It is assumed that one additional large metal mine somewhere in the state will open in the next 10 years under current law, for a total of two large metal mines opening in the next 10 years under current law. It is assumed that this additional large new mine would not be able to open under the proposed rule. In order to examine a range of possibilities, a scenario is also assumed where no new major mines will open in Montana in the next 10 years under current law (instead of two new mines opening in the next 10 years).

In the least costly scenario for mining through 2016 as a result of the proposed rule, no new mining projects will be started in the next 10 years under current law, and therefore the proposed rule would have almost no impact on metals mining in the next 10 years

except for the possible effect of diminished exploration activities. In the most costly case scenario through 2016, the proposed rule delays or prevents one of the two proposed Cabinet Mountains mines from opening and prevents an additional new major mine from opening. The other three grandfathered mines continue as they would under current law.

So, from 2006-2016 under current law, six to eight major metal mines are projected to operate in Montana (three grandfathered and continuing, one grandfathered mine that expands, two grandfathered mines that eventually close, and two new mines). Under the proposed rule, four to six major metal mines would operate in Montana (same as under current law except that the two new mines are not likely to open). In addition, mineral exploration would slow significantly. The two new mines affected by the rule would be either in the initial stages of operation or still ramping up to full production during the decade ending in 2016, so they initially have less of an effect on Montana's economy through 2016 than the fully operational mines that are already up and running. Thus, the difference between mining with and without the rule from 2006-2016 is relatively small because the two mines which would not open due to the rule would not be at full production during that decade if they did open under current law.

Based on these assumptions, in the most costly scenario, the proposed rule would deter up to 25% of metal mining economic output in Montana by 2016, but likely less than 25% in the years between 2006 and 2016. Taking into account the least costly and most costly scenarios for metal mining, and the fact that these adverse effects would take time to occur, the proposed rule would decrease metals mining by 0-25% over the entire 10-year period from 2006 to 2016, mostly as a result of deterring the two new mines. This would translate over the next 10 years (using job, wage and output numbers in the middle of their estimated future ranges) into a loss of \$0 to \$82 million annually in metal mines economic output, 0 to 546 jobs lost, and \$0 to \$28 million lost annually in wages (plus associated worker benefits lost).²⁵ From \$0 to \$3.4 million would be lost in total annual taxes from metal mining over the next 10 years. Secondary economic effects on jobs and wages would also be felt by related industries. Lincoln and Sanders Counties plus an additional county with a new mine would bear the majority of the adverse effects. The additional county would be somewhere in western or central Montana where existing deposits are located.

Effects from 2016-2026

From 2016-2026, it is estimated that the proposed rule would reduce metal mining economic output by approximately 25-50% over the entire 10-year period of 2016-2026, with up to 50% of metal mining gone by the year 2026 as a result of the rule. It is assumed for this analysis that the two new metal mines opened under current law in the 2006-2016 time period would be up to full operation in the 2016-2026 period, and that another major metal mine would open under current law in the 2016-2026 period. As with the other two new mines, the new mine projected to open in the 2016-2026 period would not open under the proposed rule. The existing mine that expanded in 2006-2016

²⁵ Job and wage numbers are decreased proportionately by the same amount as economic output numbers. These losses are in comparison to what would happen under current law.

under current law would end operations during this 2016-2026 time period. It is assumed that the Stillwater mines would stay open through 2026 and would either close shortly after that time or expand (regardless of whether the rule becomes law). Exploration activities in Montana would continue to be discouraged by the rule.

To sum up the most costly scenario for the 2016-2026 time period, under current law, six or seven major metal mines would be operating on average (six mines are operating in 2016 under current law, a new one opens during 2016-2026 bringing the total up to seven, and the expanded mine closes down bringing the total back down to six). Under the proposed rule, three or four major metal mines would operate (the two Stillwater mines and Montana Resources, plus the expanded mine which eventually ends operations during this period) with the possibility that one or both of the Stillwater mines could expand by this time. Thus, three out of six or seven major mines operating in this time period under current law would be unlikely to open as a result of the proposed rule (one expanded mine, three new mines), and the remaining three mines might incur some minor increased costs. So, up to 50% of metal mining economic output could be prohibited by 2026. A less costly scenario might see half of these effects or a 25% drop in metal mining over this time period as a result of the rule due to changes in the assumptions made (such as no new metal mines in 2016-2026 even under current law, that one of the three new mines is able to open under the proposed rule change, or innovative ways could be found for mines to expand or open under the proposed rule using current technology).

A decrease in metal mining by approximately 25-50% on average over the entire 10-year period of 2016-2026 would translate (using job, wage and output numbers in the middle of their estimated future ranges) into a loss of \$82 to \$164 million annually in metal mines economic output, 546 to 1,092 jobs lost over 10 years, and \$28 to \$57 million lost annually in wages (plus associated worker benefits lost). From \$3.4 to \$6.8 million would be lost annually in total taxes from metal mining over 10 years. Adverse secondary effects on jobs and wages would also be felt. Lincoln and Sanders counties plus an additional two counties with the new mines would feel the majority of the adverse effects during this time period

Long-Term Effects

After 2026, all six currently grandfathered mines will have closed, and anywhere from half to almost all new metal mines in the state that would open under current law would be either prevented from opening because of the proposed rule or would incur greater costs. This would lead to a 50% to 90% drop in metal mining economic output as a result of the proposed rule in the long run. If a mine were to close or not be developed because of the rule, labor unions at mines that are unionized would close and cause further economic costs, although this effect would be small compared to metal mining as a whole. Industries associated with metal mining such as in-state equipment suppliers would also be adversely affected.

The economic effects of the rule on metal mines would depend on which numbers were used in the range of numbers estimated for future mining activity under current law. In

the long run, the direct effects on total output from Montana metal mining would range from \$164 to \$294 million lost annually (using the mid-level number in the output range) with effects as high as \$524 million loss in annual output if future metal mining booms under current law (coupled with a 90% decline as a result of the rule) and effects as low as \$80 million loss in annual output if future metal mining declines under current law (coupled with a smaller 50% decline as a result of the rule). Indirect effects on other Montana industries related to metal mining would range from 900 to 1,620 jobs lost, \$23 to \$41 million lost annually in wages, and \$75 to \$135 million lost annually in economic output. In the case of a 90% loss of \$294 million in economic output annually, 1% of future expected total Montana economic output (gross state product) would be lost. If the number were \$524 million in a future mining boom scenario, then 2% would be lost.

The effects on metal mining jobs would range from 1,092 to 1,965 jobs lost (using the mid-level employment number) with up to 2,500 potential jobs lost if future metal mining booms under current law (coupled with a 90% decline from the rule) and as few as 689 jobs lost if future mining declines under current law (and experiences a 50% decline). Under the scenario of 90% loss from the proposed rule and 1,965 jobs, less than 0.5% of future expected Montana total employment would be lost. The wage effects from lost metal mining would range from \$57 to \$102 million lost annually with up to \$135 million lost if future mining booms and as low as \$46 million lost if future mining declines. Under this worst-case scenario, 1.1% of future expected Montana total wages and salary would be lost. To calculate induced losses from related industries, the economic numbers of the economic activity supported by metal mining (discussed earlier) are multiplied by 70%, the average of 50% and 90%.

Up to \$12.21 million a year would be lost in tax revenue to Montana if 90% of metal mining was lost, and \$6.79 million if 50% of mining were lost. In the worst case scenario, less than 1% of total taxes collected in Montana would be lost due to the proposed rule. Using the distributions of the gross proceeds, metalliferous mines tax, and property taxes, and using average mill distributions for all counties (not including city mills), in the worst-case scenario, \$4.5 million would be lost to the state annually, \$3.36 million to the counties and local government, \$0.9 million to special accounts, \$3.28 million to schools, and \$0.2 to miscellaneous mills (Montana Dept of Revenue Biennial Report, 2002-2004, pp. 113 and 114)²⁴.

The counties within which the affected mines and or deposits are located would be affected significantly by bearing most of the county and local effects. As an example, during the 5-year period of 1999-2003, about \$320,000 of Montana Tunnel's \$1.18 million in total taxes was paid out annually in property taxes. The taxes charged to the mine by Jefferson County in 2003 comprised 6% of the total \$8.88 million real property tax charge to all of Jefferson County, and 7% of the \$9.99 million total real property tax charged in 2004 (Patty O'Neill, Jefferson County Treasurer). In this same time period, the mine contributed between 29% and 33% of the total tax funding received by the

²⁴ In the best-case scenario, only \$2.5 million would be lost to the state annually, \$1.86 million to the counties and local government, \$0.5 million to special accounts, \$1.82 million to schools, and \$0.1 million to miscellaneous mills.

Clancy Elementary School District, and an average of 10% of the total received by the Boulder High School District (Patty O'Neill, 2004).

TABLE 5-Estimated Economic Loss to Montana as a Result of the Decrease in the Metal Mines Sector Under the Proposed Rule

	Most Costly Case*	Mid Level Case	Least Costly Case**
Jobs Lost	2,500	1,092 to 1,965	689
Annual Wages Lost	\$135 M	\$57 to \$102 M	\$46 M
Annual Economic Output Lost	\$524 M	\$164 to \$294 M	\$80 M
Tax Revenue Lost		\$6.8 to \$12.2 M	
Induced Effects from Related Industries	Average annual loss: 1,260 jobs, \$32 M wages, \$105 M economic output		
Other Effects	Non-significant loss of metals for U.S. and world use. Certain counties bear most of economic and psychological costs		

M=Million

*Most costly case assumes a future mining boom under current law and a 90% loss in metal mining as a result of the rule.

**Least costly case assumes a future decrease in mining under current law and a 50% loss in metal mining as a result of the rule.

Effects on Industrial Mineral Mining

It is estimated that 10-25% of future industrial mineral mining would be adversely affected by this rule. Talc mines would be affected the most within this sector by the proposed rule. As a result of the rule, less talc would be available for national and world consumption. The only significant effect this might have is to moderately affect the national supply of talc (an estimated less than 10% decrease in future national supply). Current talc operations such as the Treasure Mine and the Yellowstone Mine might be limited in certain applications due to potential nitrate problems. New talc mines might not be able to open. In general, rock quarries would not be affected by the proposed rule due to the fact that they typically have no water discharges.²⁵

Talc mining and other miscellaneous categories make up 2/3 of total economic output for the industrial mineral mines sector (stone making up the other 1/3), and an estimated 15-33% of talc mining would be prohibited in the future as a result of the proposed rule. Thus, for the sector overall, there would be approximately a 10-25% reduction in industrial mineral mines economic output as a result of the proposed rule. This percentage range applies to all talc and hard rock mining that falls under the MMRA. In economic terms, these numbers translate into about 50 to 120 jobs lost (or up to 160 jobs

²⁵ Montana has no quarries at this time that produce discharges with nitrates. Only one operating talc and one closed chlorite mine currently have had nitrate problems in Montana. The potential exists for quarries to have nitrate problems in the future. Larger industrial mineral mining operations are the ones that will have nitrate problems that last for more than two years.

lost if mineral mining booms), \$0.8 to \$3.1 million lost annually in wages, \$4 to \$19 million lost in economic output, and up to \$0.75 million lost annually in taxes. It is possible that losses could be higher if a large talc company had to close prematurely as a result of not being able to mine talc in the future. To calculate induced losses from related industries, the economic numbers of the other industries supported by mineral mining (discussed earlier) are multiplied by 18%, the average of 10% and 25%.

TABLE 6-Estimated Economic Loss to Montana as a Result of the Decrease in the Industrial Mineral Mines Sector Under the Proposed Rule

	Most Costly Case*	Least Costly Case**
Jobs Lost	120	50
Annual Wages Lost	\$3 M	\$1 M
Annual Economic Output Lost	\$19 M	\$4 M
Tax Revenue Lost	\$0.75 M	\$0.3 M
Induced Effects	Average annual loss: 31 jobs, \$0.7 M wages, \$3 M economic output	
Other Effects	A moderate effect on U.S. talc supply (less than 10%)	

M=Million

*Most costly case assumes a 25% loss to industrial mineral mining as a result of the rule.

**Least costly case assumes a 10% loss to industrial mineral mining as a result of the rule.

Effects on the Department

Effects on the Montana DEQ from the proposed rule would consist of reduced mining-related revenues to the Department and possibly fewer DEQ jobs (no more than 5-10 jobs lost) due to less mining activity. Revenue reductions to DEQ stemming from the proposed rule would be a result of: 1) the reduced ability of future mines (through their payment of taxes) to pay back reclamation bonds that DEQ has previously issued and those likely to be sold in the future, and 2) less revenue paid into the Resource Indemnity Trust (RIT) Fund. Some of the interest generated by the RIT provides support for individual programs at DEQ.

The impact to DEQ from a complete loss of Metalliferous Mine Tax RIT revenue would be approximately \$350,000 per biennium or \$175,000 per year. Multiplying this number by 50-90% would give a total effect from the proposed rule of \$88,000 to \$158,000 per year lost to DEQ from lower RIT collections.²⁶ Less money going into the RIT fund

²⁶ The metalliferous mine tax (MMT) is distributed to five separate funds. One of those funds is the Reclamation and Development state special revenue account (RDGA).²⁶ This account receives revenue from other sources as well, including "interest" from the RIT. Appropriations from the RIT fund are legislatively approved for many uses within state government including uses within DEQ for the Hard Rock Program, Opencut Program, and Coal Program in the Permitting Division, Legal Unit, and Enforcement Division. If metalliferous mine taxes completely disappeared, the impact on the RDGA would be approximately \$525,000 per year or \$1,050,000 per biennium. The RDGA has a biennial appropriation across state government of \$11,980,987 and DEQ's appropriation from this account is \$5,341,547 for the 06-07 biennium or approximately 1/3 of the total appropriations. The statute does not state which appropriations are funded first, but it is assumed that the revenue impact would be distributed

would not only impact DEQ, but also several DNRC programs, the State Library, the Governor's Office and some local districts. To the extent that the metalliferous mines tax was reduced by the proposed rule, the state general fund would pick up the responsibility of retiring bonds for the purpose of doing reclamation work when bonding is inadequate.²⁷ It is beyond the scope of this impact statement to estimate the dollar amount loss that would occur from a reduction in other mining-related revenues DEQ receives. The Montana Bureau of Mines and Geology and Montana Tech could be affected as well by fewer mines, but no job losses are expected.

Another cost to the department could be the need to make the "clear and convincing" demonstration of "no treatment required after two years" as called for in the proposed rule. Given the complexity of large mineralized systems and the minute amount of actual material which could be tested in a reasonable amount of time, it would be difficult, if not impossible, for regulators to demonstrate that a large mine would not have any constituents that would exceed standards and require either a mixing zone or treatment after two years following closure. Scientific studies allow reasonable conclusions or inferences to be drawn, but not guarantees.

Benefits of the Proposed Rule

Benefits from the proposed rule would include a lower probability (or prevention) of taxpayers having to pay water treatment costs into perpetuity after mine bonds run out. The State of Montana and ultimately state and federal taxpayers could benefit from the proposed rule because mines with long-term water treatment requirements would not be permitted, thus limiting the risk that reclamation bonds would be inadequate to cover water treatment costs in the future. For certain mines in the past, this taxpayer burden has been significant. It is important to note, however, that most of the mines that have been a burden to taxpayers in the past could not be permitted under current law as they would be illegal today. Therefore, this taxpayer benefit may not be as significant as it would have been in the past. Although the situation at Zortman and Landusky is thus not directly relevant due to the current ban on cyanide heap-leach mining in Montana, water treatment at these mines has proven to be substantially more costly than anticipated in the bonds established in 1996. Available funding from the bonds, from 2007 through 2017, totals \$731,321 per year. Anticipated water treatment expenses exceed this level by approximately \$750,000 per year. No funds are currently identified to address this discrepancy beginning in 2007.

Also, less enforcement would be needed for violations on future mining projects that don't open and this would save taxpayer money. Less remedial action in general may be

equitably across all of the state's programs with appropriations. Thus, the impact to DEQ would be approximately \$350,000 (\$1,050,000/3) for the biennium or \$175,000 per year. Taking 50-90% of this number would give a total effect from the proposed rule of \$88,000 to \$158,000 per year lost to DEQ.²⁸ 8.5% of the MMT is deposited into the Hard Rock Bond Issuance Account (02988). The Board of Examiners may authorize issuance of bonds drawing on this account for the purpose of doing reclamation work when bonding is inadequate and there is no longer a responsible party to go to for money. These bonds are General Obligation bonds.

needed in the future with fewer mines, also saving taxpayer money. Money saved by taxpayers would be a benefit that is spread relatively evenly across the state.

Another potential benefit is that Montana might also be perceived as more attractive to new residents and to tourists if the rule passed (regardless of the magnitude of the actual benefit that the rule would create). More residents could be seen as a benefit or as a cost by current residents of Montana. Any Montanans that move into the state seeking a clean environment as a result of the rule could offset some of the economic loss to mining (as a result of the rule) from their very presence and socio-economic diversity. Few people would actually move to Montana solely based on the passage of the proposed rule, but perhaps as a result of several developments including the rule. Some current residents might also see the rule as making the state more attractive, providing a benefit. The rule would be a benefit by better protecting human and aquatic life (and could result in fewer human health advisories). The size of that benefit would be small on a state-wide basis, as water quality standards must already be met under current law, and those standards are already designed to protect human and aquatic life. The increment of water quality improvement from the rule would likely be small on a state-wide basis, but could be significant in localized areas downstream from mines. It can be argued that other past efforts to protect state waters, such as the recent cyanide ban (I-137, I-147) have made a much larger beneficial impact on water quality than this rule would. If new types of mining were developed in order to comply with the rule, mineral exploration activities might actually increase over current levels.

Another benefit to society as a whole including the U.S. as a whole would be the fuel, electricity, tires, machinery and other equipment saved as a result of less mining. This energy and equipment would be available for other projects in the U.S. economy or could simply be conserved. As an example, large industrial tires used in mining are currently in short supply in the U.S. for large industrial applications, and could be valuable to economic activity elsewhere if future Montana mines did not open. Mines that stayed open despite the new rule might have to hire additional workers to better ensure high water quality during and after mine operation. This could create additional jobs and income that might offset a small portion of jobs lost.

Other emotional, psychological and political benefits would accrue to various classes of individuals, depending on their points of view. Environmental groups would likely view the rule positively as would the Fort Belknap Reservation and perhaps some people that live out of state. Fewer people working at DEQ would save a very small amount of taxpayer money.

Summary of Benefits and Costs of Proposed Rule

TABLE 7-Summary of Benefits and Costs of Proposed Rule

Benefits	Costs
<ul style="list-style-type: none"> • Lowering of taxpayer risk of having to pay for perpetual water treatment • Less enforcement and remedial action needed as a result of fewer future mines • Increased protection of human and aquatic life (in areas near future mines) • Increased attractiveness of Montana to existing and future residents • New jobs from additional water treatment during mine life • Savings of fuel, electricity and equipment from fewer mines • Emotional benefits to certain classes of people in and outside of Montana 	<ul style="list-style-type: none"> • 50-90% of future metal mining and 10-25% of future industrial mineral mining prohibited under the rule • 740 to 2,600 jobs lost • \$47 to \$138 million in wages lost each year • \$84 to \$543 million in economic output lost each year • \$7.1 to \$16.5 million in tax revenue lost each year (costs borne roughly evenly by state general fund, county and local government, and schools) • Induced impacts on other industries of 1,300 jobs, \$33 million in wages and \$108 million in economic output • Emotional costs to workers, counties, towns, and rule opponents • No significant reductions in U.S. metal supply • U.S. metal supply might be moderately reduced

Alternatives to the Proposed Rule

- Exempt nitrates from the proposed rule. If nitrate-nitrite and ammonia-nitrogen were left out of the rule, the effects on industrial mineral mines would be eliminated, and thus change the analysis. Any potential effects of the rule on the two Stillwater mines would also be eliminated. The adverse effects of the proposed rule would be up to 5% lower if nitrates were taken out, although the main effects from the rule on metal mines would largely go unchanged.
- Clarify the department's authority under 82-4-336(3) to provide "a longer period" before discharged water has to meet standards. In this case, the effects on metal mines could be reduced, if better defined allowable time periods longer than two years were set for each mine.
- Increase bond levels for long-term water treatment (see Section 4.2 of the accompanying Alternatives Analysis prepared by HydroSolutions).
- For mines, alternatives to ANFO exist for explosives, but are more expensive, and may create different water quality problems. Emulsions, one alternative to ANFO, are 2-5 times more expensive and break down over longer periods of

time. Military surplus explosives are not a predictable source of supply and, along with nitroglycerine and dynamite, can increase the cost of explosives by a factor of 5-10. Blasting techniques and handling can also be modified to reduce nitrates, but that topic is beyond the scope of this analysis.

- Allowing mixing zones and nitrate impacts under the rule would allow some mines to have minor exceedances of some metals. These mines could be permitted and still comply at the mixing zone boundary without treatment.

Efficient Allocation of Public and Private Resources

The alternatives listed above would result in a more efficient allocation of public and private resources than the proposed rule. They would prevent water pollution targeted by the rule while allowing for development of some ore bodies that would not be developed under the proposed rule as currently written.

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Appendix A-Regulated Pollutants Commonly or Occasionally Found in Drainage Water at Mine Sites

Carcinogens

- arsenic
- beryllium
- pentachlorophenol (only if used in treating timbers in older underground mines)
- uranium
- beta and gamma emitters, radium, radon

Toxic Pollutants

- aluminum, dissolved (pH 6.5 to pH 9.0 only)
- total ammonia nitrogen
- antimony
- barium
- cadmium
- chromium, all forms
- chromium, hexavalent
- chromium, trivalent
- copper
- cyanide
- fluoride
- hydrogen sulfide
- lead
- mercury
- nickel
- nitrate
- nitrite
- oxygen, dissolved (below minimum values for aquatic life)
- selenium
- silver
- strontium
- thallium
- zinc

Pollutants that are neither carcinogenic nor toxic

- iron (harmful)
- manganese (harmful)
- total inorganic nitrogen (nutrient)
- phosphorus (nutrient)
- pH (harmful)
- turbidity (harmful)
- color (harmful)
- temperature (harmful)

Appendix B-Determining Ranges for Jobs, Wages and Economic Output in Order to Estimate Future Mining Economic Activity in Montana

Economic Output and Gross State Product Baseline Numbers²⁸

(All numbers in 2005 dollars)

From 1977 to 2002, the annual economic output (annual production value) of all metal mine production in Montana (metric tons times price in 2005 dollars) has ranged from \$149 million (1985) to \$743 million (1991) with an annual average of \$458 million. Economic output in 2002 was \$327 million.²⁹ Taking out the highest and lowest years gives a range of \$160 to \$582 million to use for estimated future mining economic output. From 1977 to 2002, industrial mineral mining in Montana (talc and stone) has ranged from \$41 million to \$77 million in annual economic output. Using the highest and lowest years gives a reasonable range. Economic output for mineral mining averaged \$57 million annually in that time period and was at the low end of the range in 2002.³⁰

From 1977 to 2004, all mining in Montana including metal, industrial mineral, coal, and oil and gas, has ranged from \$466 million in annual Gross State Product (GSP) to \$1.662 million (1981) with an annual average number of \$911 million.³¹ GSP is a comparable value to economic output and is the total value of goods and services produced in the state on an annual basis. Total economic numbers for all mining and all of Montana's economy were only available in GSP. Taking out the highest and lowest years gives a range of \$645 to \$1.474 million in GSP for all mining in Montana.

Montana's total GSP for its entire economy in those years ranged from \$6.390 million (1977) to \$23.913 million (2002), generally rising each year. Because of inflation, it is appropriate to use the latest 2002 number as a benchmark with the understanding that this number will grow on average each year due to the general trend of growth seen historically. As just mentioned, the average annual GSP for all mining over those 28 years has been \$911 million annually in current dollars with lower than average numbers

²⁸ These data were compiled by Susan Ockert, Montana Department of Commerce, Census and Economic Information Center November 2005. Unless otherwise indicated, these data were obtained from the U.S. Bureau of Economic Analysis, Regional Economic Accounts. From 1977 to 1997, data were reported in SIC code. From 1997 to 2004, data were reported in NAICS code. The change from SIC to NAICS code was a joint effort between the U.S., Canada and Mexico in order to be able to compare and track data for the North American Free Trade Agreement (NAFTA). The U.S. Census Bureau then implemented the agreement (Susan Ockert, Montana Department of Commerce, Census and Economic Information Center, November 2005). There is some discrepancy in mining numbers between the SIC code and the NAICS code numbers, but not enough to significantly affect the results.

²⁹ 'Mineral Production and Mining Trends for selected non-fuel commodities in Idaho and Montana,' 1905-2001, Historical Statistics for Mineral and Material Commodities in the United States, U.S. Department of Interior, and U.S. Geological Survey, <http://minerals.usgs.gov>.

³⁰ Data obtained from various publications from the USGS, such as the Montana Mineral Yearbook (which has changed names over time), Mineral Production and Mining Trends for selected non-fuel commodities in Idaho and Montana, 1905-2001, Historical Statistics for Mineral and Material Commodities in the United States, Mineral Commodity Summaries, 2003, and the U.S. Mineral Industry Survey

³¹ U.S. Bureau of Economic Analysis, Regional Economic Accounts.

in recent years. The range used in this impact statement is \$645 million to \$1,474 million. From 1997 to 2002, the percentage that all mining economic output comprises as a portion of Montana's total GSP has been in the 3.0% to 3.5% range. Metal mining and industrial mining, the industries affected by the rule, together average just over 1.2% of total economic output in Montana today.

It is assumed that the economic output for future mining and metal mining will fall into the range of the past 28 years. Thus, for metal mining, the range used is a low of \$160 million (the second lowest year from 1977-2002), the mid-range number is \$327 million (output from 2002), and the high-range number is \$582 million (the second highest year from 1977-2002). The same is done for industrial mineral mining (talc and stone only), where the low economic output number used is \$41 million, the middle number is \$57 million, and the high number is \$77 million.

Employment

From 1977 to 2004, employment for all mining in Montana (including coal mining and oil and gas) has ranged from 6,528 jobs to 12,589 jobs, with an average number of 7,897 (U.S. Bureau of Economic Analysis, Regional Economic Accounts).³² Taking out the highest and lowest years gives a usable range of 6,709 to 10,634 for all mining. From 1977 to 2002, employment in metal mining in Montana has ranged from 1,157 jobs to 2,885 jobs.³³ Taking out the highest and lowest years gives a range of 1,378 to 2,785 jobs. Employment for metal mines averaged 2,183 from 1977-2002 and was 2,127 in 2002. From 1977 to 2002, employment for industrial mineral mining has ranged from 350 to 636. A middle number between these two is 490. Montana's total employment numbers for all jobs in the state from 1977-2004 averaged 486,420, with numbers generally rising each year and recent numbers just under 600,000. It is assumed that future total employment in Montana will average more than 600,000 due to the general trend of rising population and total employment in the state. From 1977 to 2004, the percentage that all mining comprised as a portion of Montana's total employment was in the 1% to 3% range with recent numbers just over 1%. Metal mining and industrial mining put together average about 0.5% of total jobs in Montana (U.S. Bureau of Economic Analysis, Regional Economic Accounts, U.S. Census, 2002 Economic Census).

It is assumed that the employment for future metal mining and industrial mineral mining will fall into the range of what has occurred the past 28 years. Thus, for metals mining, a low-range number is 1,378, a mid-range number is 2,183, and a high-range number is

³² The change from SIC to NAICS code was a joint effort between the U.S., Canada and Mexico in order to be able to compare and track data for the North American Free Trade Agreement (NAFTA). The U.S. Census Bureau then implemented the agreement (Susan Ockert, Montana Department of Commerce, Census and Economic Information Center, November 2005). There is some discrepancy in mining numbers between the SIC code and the NAICS code numbers, but not enough to significantly affect the results.

³³ From 2001 to 2004, NAICS codes do not break out metal mining from other types of mining. 2001 and 2002 numbers were taken from the IMPLAN model run by Susan Ockert.

2,785. For industrial mineral mining, the low number is 350, the middle number is 490 (halfway between the high and low numbers), and the high number is 636.

Personal Income

It is not instructive to look at long-term ranges or averages for Montana mining personal income because those numbers are reported in real dollars and do not take into account inflation. If we look at the last five years of available data on personal wages for all mining in Montana, the average total wages paid out from 2000-2004 have been \$278 million annually (U.S. Bureau of Economic Analysis, Regional Economic Accounts). For metal mining from 1996-2000, this total annual wage number is \$92 million annually and was \$113 million in 2002.³⁴ We use \$92 million as a lower bound (considering that future inflation will generally lead to increased wages over time) and based on the upper metal mine job range estimate, \$150 million is used as an annual wage upper bound (for metal mining). For industrial minerals mining from 1996-2000, the 2002 wage number is \$7.7 million. Because talc and stone output is currently at the lower end of its range, this number is used as a lower bound. Based on the upper industrial mineral mining jobs range estimate, \$12.4 million is used as an upper bound for annual total wages. Montana's total wage and salary disbursements from 2000-2004 averaged about \$11 billion with numbers generally rising each year and recent numbers being just over \$12 billion. From 1997 to 2004, the percentage that all mining comprised as a portion of Montana's total wage and salary disbursement has been around 2.5% whereas the portion contributed by metal and industrial minerals has been just over 1% of Montana's total wage and salary disbursement..

The average wage in Montana for all types of mining is just over \$53,000, while compensation for all employees tied to the metal mining industry averages about \$40,000. With the high value of the metal, such as gold, silver, molybdenum, palladium and platinum, the output per worker averages over \$150,000. On the other hand, the output per worker for all industries supported by metal mining averages \$121,000 (Department of Labor and Industry, Research and Analysis Bureau Web site).³⁵

³⁴ From 2001 to 2004, NAICS codes do not break out metal mining from other types of mining

³⁵ Calculated from 2004 and first quarter of 2005 by Susan Ockert

